



Molecular Assembly of Hemin on Single-Crystal Au(111)-electrode Surfaces

Zhang, Ling; Ulstrup, Jens; Zhang, Jingdong

Publication date:
2016

Document Version
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):
Zhang, L., Ulstrup, J., & Zhang, J. (2016). *Molecular Assembly of Hemin on Single-Crystal Au(111)-electrode Surfaces*. Abstract from The 6th Baltic Electrochemistry Conference, Helsinki, Finland.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Molecular Assembly of Hemin on Single-Crystal Au(111)-electrode Surfaces

Ling Zhang*, Jens Ulstrup and Jingdong Zhang

Department of Chemistry, Building 207, Technical University of Denmark, 2800 Kongens Lyngby, Denmark

*Presenting Author: linzh@kemi.dtu.dk

ABSTRACT

Iron porphyrin, hemin, is the active core in cytochromes, haemoglobin and myoglobin, and enzymes such as the peroxidases. These metalloproteins are engaged in respiratory electron transfer, oxygen transport and storage, and enzyme catalysis in the biosynthesis of a range of metabolites. Hemin itself also acts as catalyst in electrochemical reduction of dioxygen and other small inert molecules such as nitrogen monoxide, and in electrochemiluminescent detection of dioxygen, peroxide, DNA, and proteins [1, 2].

π - π interactions of hemin with carbon materials have been broadly studied [3]. Hemin on noble metal surfaces has been prime targets in high-resolution STM [4] but much less used in applied contexts such as biosensors and drug delivery. How hemin molecules interact with noble metal surfaces offers, however, other challenges in nanoscale and single-molecule science. We have studied hemin adsorption on well-defined single-crystal Au(111)-electrode surfaces using electrochemistry combined with scanning tunnelling microscopy under electrochemical control. Hemin gives two voltammetric peaks assigned to adsorbed monomers and dimers (Fig. 1A). *In situ* STM shows that hemin self-assembles in ordered monolayers through non-covalent adsorption, as the reconstruction of the Au-(111) surface underneath the hemin layer is clearly visible (Fig. 1B).

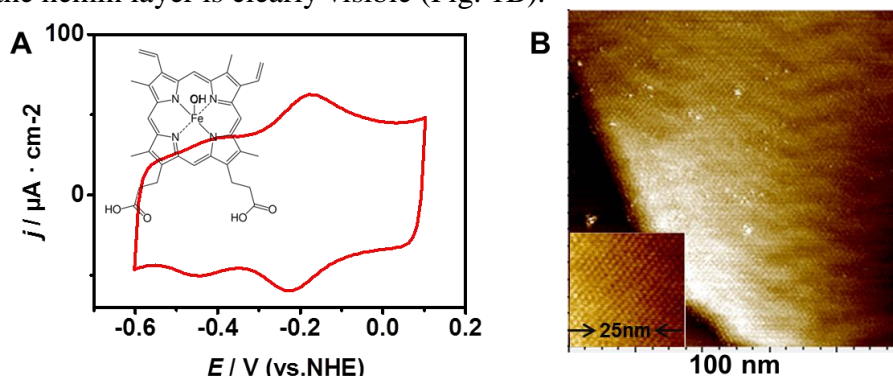


Fig. 1. (A) Voltammogram of hemin modified single-crystal Au(111) electrode in NaOH solution, pH 11.9. Scan rate, 3 V/s. (B) *In-situ* STM of hemin modified Au(111) electrode surface in NaOH solution, pH 11.5. E_{sample} , 0.20 V, E_{tip} , 0.06 V vs. NHE. $100 \times 100 \text{ nm}^2$.

REFERENCES

- [1] S. Severance and I. Hamza, Chem. Rev., 109 (2009) 4596.
- [2] H. Zhang, F. Li, B. Dever, X.-F. Li and X.C. Le, Chem. Rev., 113 (2013) 2812.
- [3] T. Xue, S. Jiang, Y.Q. Qu, Q. Su, R. Cheng, S. Dubin, C.Y. Chiu, R. Kaner, Y. Huang and X.F. Duan, Angew. Chem. Int. Ed., 51 (2012) 3822.
- [4] S. Yoshimoto, J. Inukai, A. Tada, T. Abe, K. Itaya, T. Morimoto, A. Osuka and H. Furuta, J. Phys. Chem. B, 108 (2004) 1948.